REMARKS

At the outset, Applicants' representative wishes to thank Examiner Hajnik for the patience and courtesy exhibited during an interview on March 19, 2008.

Claims 1 and 10 have been amended in order to more particularly point out and distinctly claim the subject matter which Applicants regard as the invention. No new matter has been added.

Newly amended Claims 1 and 10 are directed to a method for culling small objects in a system for shading 3-dimensional computer graphics images which comprises the steps of subdividing a display on which an image is to be viewed into a plurality of rectangular areas, deriving a list of objects in the image which may be visible in each rectangular area, determining maximum and minimum values for an object in the list in x and y directions, determining a set of sampling points for the object from the maximum and minimum values, surrounding the object with a bounding box, determining if the bounding box covers any of the sampling points, culling the object if the bounding box misses all of the sampling points, testing each sampling point against each edge of the object if the bounding box does not miss all the sampling points and culling the object if the object does not cover any sampling points, and an apparatus for performing the method. The method and apparatus of Claims 1 and 10 perform a two-step evaluation as to whether an object is to be culled, (1) the object is culled if a bounding box surrounding the object misses all of the sampling points and (2) the edge of each sampling point is tested against each edge of the object if the bounding box does miss all of the sampling points and the object is culled if the object does not cover any sampling points.

Claims 6 and 15 are directed to a method for shading 3-dimensional computer graphics images which comprises the steps of subdividing a display for an image into a plurality

of rectangular areas, for each object in the image, determining a bounding box of rectangular areas into which the object may fall, testing edge information from each object against the consistent sample point in each rectangular area to determine whether or not the object falls into each of the rectangular areas in the bounding box and inserting the object in an object list for a rectangular area in dependence on the results of the determination, wherein the step of testing edge information includes the step of shifting the edge information by a predetermined amount in dependence on the orientation of each edge and an apparatus for performing this method. In these claims, the edges of the polygon are adjusted only once during an initiation phase with the amount of adjustment, if any, depending on the orientation of the edge. A sampling of the shift triangle at the corner of the tiles determines whether the original triangle has any intersection with a tile. It is respectfully submitted that the currently claimed invention clearly is patentably distinguishable over the prior art cited by the Examiner.

As pointed out previously, the Redshaw reference is directed to a method for minimizing the total number of tiles or rectangular areas which require processing by determining the minimum set of rectangular tiles that a particular object crosses and then only processing those tiles when trying to render that object. This reference discloses that it is only necessary to process objects which intersect with a particular region or area, i.e., tile, and a triangle is utilized to represent the vertices of the object and a bounding box is generated from the triangle and effectively defines a rectangular area within the screen which contains the object. The bounding box for the object is utilized to obtain a list of tiles located within the bounding box and this list of tiles is a subset of all of the tiles within the screen and approximates the tiles which intersect with the object. This reference does determine a minimal set of tiles with which the triangle representing the object to be rendered intersects

with and then only processes those tiles when rendering the object so as to prove processing efficiency. This method completely ignores the limited set of sampling positions used when rendering pixels within each tile which can result in redundant work for very small triangles.

In contrast to the Redshaw reference, the presently claimed invention considers the specific sampling locations and small triangles which will be missed by the sampling locations are rejected early thereby saving later processing effort. As discussed above, the present invention utilizes two steps to determine whether the object should be deleted. First a bounding box surrounding the object is analyzed to see if it covers any of the sampling points derived from the maximum and minimum values of the object in x and y directions and the object deleted if the bounding box misses all of the sampling points and then each sampling point is tested against each edge of the object if the bounding box does not miss all the sampling points and the object deleted if the object does not cover any sampling points.

In the interview, the Examiner seemed to suggest that the method of Redshaw would also result in objects being deleted. However, the present claims require the selection of a specific object and then performing the two tests to determine whether this specific object should be deleted as opposed to some extraneous object being deleted by the elimination of tiles which are not processed in the Redshaw patent. Therefore, the secondary Deering reference must provide the motivation to one of ordinary skill in the art to modify Redshaw et al in a manner that would yield the presently claimed invention. It is respectfully submitted that Deering contains no such disclosure.

The Deering reference, like the Redshaw et al reference, is concerned with determining a minimum number of bins or tiles which are rendered comprising tracing along the edges of the triangle to determine the extremity of the ideal tiles to reduce the number of tiles that are processed. Like the

previously discussed reference, this reference has no disclosure with respect to determining whether a particular object should be rendered by performing a two-step evaluation. The fact that some ancillary object may be deleted through the elimination of tiles which do not contain the subject object does not read on the presently claimed invention. Therefore, Deering in combination with Redshaw et al does not even present a showing of prima facie obviousness under 35 USC 103(a) with respect to the presently claimed invention.

The Pearce reference has been cited by the Examiner as teaching testing the edge information from each object against a consistent sample point in each rectangular area to determine whether or not the object falls into each of the rectangular areas in the bounding box. However, as pointed out previously, the Pearce reference is directed to a method of simulating motion blur. As such, Pearce discloses motion vectors for the vertices in a three-vertex polygon that describes the motion of vertices as the three-vertex polygon moves from an initial to a final position. This reference teaches the simulation of motion blur by identifying intersections of pixel sampling points with the edges of moving polygons. The edges of the polygons are moving as the polygons are moving and, therefore, Pearce is not relevant with respect to shifting edge information of an object by a predetermined amount.

The presently claimed invention does not have the edges moving through time, the edges of the polygon are adjusted only once during the initiation phase with the amount of adjustment depending on the orientation of the edge. A sampling of the shift triangle at the corner of the tiles determines whether the original triangle has any intersection with the tile. Applicants respectfully submit the Examiner is choosing bits and pieces out of the Pearce reference and combining it with the Redshaw et al reference by excluding the teachings of the Pearce et al reference as a whole. Given the differences in the processes of Pearce and Redshaw et al, one

of ordinary skill in the art would not attempt to combine the teachings of the references as put forth by the Examiner and only hindsight provided by the present disclosure is motivating the Examiner to do so. Therefore, Applicants respectfully submit that the presently claimed invention is clearly patentably distinguishable over Redshaw et al in combination with Pearce.

The remaining secondary references cited by the Examiner, Vatti et al and Venkataraman et al do not cure the deficiencies of the previously discussed references with respect to the independent claims. Therefore, these references in combination with the previously discussed references do not even present a showing of prima facie obviousness under 35 USC 103(a).

Reconsideration of the present application and the passing of it to issue is respectfully solicited.

Respectfully submitted,

Terryence F. Chapman

TFC/smd

FLYNN, THIEL, BOUTELL & TANIS, P.C.
2026 Rambling Road
Kalamazoo, MI 49008-1631
Phone: (269) 381-1156
Fax: (269) 381-5465

David G. Boutell	Reg. No. 25 072
Terryence F. Chapman	Reg. No. 32 549
Mark L. Maki	Reg. No. 36 589
Liane L. Churney	Reg. No. 40 694
John A. Waters	Reg. No. 24 802
Brian R. Tumm	Reg. No. 36 328
Donald J. Wallace	Reg. No. 43 977
Stephen C. Holwerda	Reg. No. 57 391
Dale H. Thiel	Reg. No. 24 323
Sidney B. Williams, Jr.	Reg. No. 24 949
Heon Jekal	Reg. No. L0379*

*limited recognition number

Encl: Postal Card

136.07/05